begin our party took their positions. I was about twenty feet to the south of Prof. Hough, who was in a group consisting of himself, Prof. Colbert, and Prof. Easterday, who used the telescope for observing the corona. To the west was a class of fifteen young ladies from Denver, instructed by Prof. Colbert to sketch the corona. Southeast of my position Mr. Thomas was stationed.

"When arranging my instrument I made the post very low, exciting much comment by my companions. them I intended to lie on the ground during the observations, this being a position I had found the easiest in my experience of twenty years' comet-seeking. I spread a carpet on the earth and had a great advantage over the other members of the party, who were obliged to assume constrained positions, which tended to unsteadiness of vision. Seated by me was Daniel Drummond, with an accurate timepiece, set by the chronometer a few minutes before the first contact. E. D. Smith, an old acquaintance, whom I met in Denver, recorded the time of each event as I called it. Mr. Drummond is an experienced engineer, and counted the seconds with great accuracy.

"As I arranged my telescope for the first event the wind was blowing in fitful gusts from the south-east, shaking our instruments. To prevent my instrument from swaying I tied a long stick to it, about a foot above the eyepiece, the other end being braced against the ground and free to move only in one direction. This was a blunder to which I owe the discovery of a stranger, which I am inclined to think is Vulcan. As the sun moved the eye end of the telescope moved to the east. The stick would not allow any backward movement, and when I attempted to observe the sky to the east of the sun I could not. This confined my area of vision to a small distance west of the sun. But to return to the observation. My observation of the first contact was four seconds later than the observation of Prof. Colbert. The following is my record of events by Washington

First contact	 	 	4 11 18
Bailey's beads	 	 	5 20 22
Beginning of totality	 	 	5 20 38
Corona first seen	 	 	5 23 17
End of totality	 	 	5 23 26
End of eclipse	 	 	6 26 35

h. m. s.

"The watch was one second slow of the chronometer at the first contact, two seconds at the end of totality, and four seconds at the end of the eclipse. Before the eclipse began I had made up my mind to observe the general phenomena, the corona, protuberances, and Bailey's beads for about half a minute at the beginning I designed a minute and a half for a of totality. I designed a minute and a half for a search for Vulcan, and the remainder, some forty odd seconds, to observe the phenomena at the end of totality.

"About one minute after totality two stars caught my

eye about three degrees, by estimation, south-west of the sun. I saw them twice, and attempted a third observa-tion, but a small cloud obscured the locality. The stars were both of the fifth magnitude, and but one is on the chart of the heavens. This star I recognised as Theta in Cancer. The two stars were about eight minutes apart. There is no such configuration of stars in the constellation of Cancer. I have no doubt that the unknown star is an infra-Mercurial planet, and am also inclined to believe that there may be more than one such planet. In 1859 the French astronomer Lescarbault claimed that he had seen an intra-Mercurial planet crossing the sun's disc. He related his discovery to Leverrier, who became a firm believer in the existence of such a planet. The perturbations of Mercury's orbit demand such a planet as Leverrier named Vulcan. The star I saw may have been the same that was seen by Prof. Watson, who was located at Rawlings, Wy. T.
"I possessed a comet eye-piece of very flat and large

field and distinct to the very edge. It was made in this city, and to it and my blunder in failing to untie my instrument I owe my success. Prof. Colbert, of our party, also searched for Vulcan, but his field was not large. saw but two protuberances, and those just at the end of totality. The advancing moon uncovered them. I had a view for at least two seconds of the sun's chromosphere at the same time. The chromosphere, by my measurement, is 2,000 miles in thickness. It is a layer of red-hot hydrogen surrounding the sun. The protuberances are

projected from it.

"The corona was unusually extensive. It had never been seen so far extended. The greatest prolongation was in the direction of the moon's path across the sun, and as drawn by some of the parties extended on each side of the sun to a distance of more than three million The pencils of light were radial mostly, though some of them were curved. I came away so quickly from Denver that I did not learn of the success of the other parties. In comparing notes with our party, Prof. Hough agreed with me in the measurement of the chromosphere. This measurement is made by calculating the time it takes the moon to pass over it. I learned of Prof. Watson's discovery the day after the eclipse. I have not seen him since he made the observation.'

## OUR ASTRONOMICAL COLUMN

WATSON'S SUSPECTED PLANET.—At the instance of M. Mouchez, the director of the Bureau des Calculs of the Observatory at Paris, M. Gaillot, who so long assisted Leverrier in the formation of his planetary tables, has examined how far the position of the object seen by Prof. Watson will accord with the more probable of the orbits which Leverrier inferred for a hypothetical planet, from the observations of suspicious spots in transit over the sun's disc. It may be remembered that their discussion led to a general formula, which was thus expressed by Leverrier;  $\nu$  being the heliocentric longitude of the planet, k an indeterminate which might have values positive or negative, but necessarily whole numbers, and the number of days reckoned from the beginning of the year 1750:-

$$\nu = 139^{\circ} \cdot 94 + 214^{\circ} \cdot 18 \ k + (10^{\circ} \cdot 901252 - 1^{\circ} \cdot 972472 \ k) \ j + (-5^{\circ} \cdot 3 + 5^{\circ} \cdot 5 \ k) \cos \nu$$

M. Gaillot has found that, of the four possible orbits retained by Leverrier, corresponding to k = -2, -1, 0, and +1, respectively, the first agrees the closest with the observation. With this value of & the diurnal motion the observation. With this value of & the duffial motion is 14°8462, the semi-axis major o 164, and the period of revolution 24'25 days—less than the period of the sun's rotation. When the question of eccentricity is introduced, it is remarked that in the preferable orbit it is already very considerable, and comparable with that of the orbit of Mercury, and it is easy to demonstrate, to use M. Gaillot's words, "qu'il peut y avoir identité absolue entre la position observée et la position prévue." In fact, he finds that the agreement will be perfect if the eccentrihe finds that the agreement will be perfect if the eccentricity is assumed o 14, and the longitude of the perihelion 74°. With regard to the inclination of the orbit to the ecliptic, M. Gaillot, from further consideration, supposes it may not exceed 7°. He notes that the most serious objection which opposes itself to the identification of the object observed, with a planet moving in the orbit indicated by Leverrier's formula, is that we should see but a very small part of the disc illuminated, and without denying that there is reason in this objection, M. Gaillot adds that Prof. Watson describes "as being of the fourth magnitude, a star the diameter of which may be comparable with that of Mercury, and which, in superior conjunction, may appear of the first magnitude." He further remarks that while it is not possible to decide with certainty upon the identity of

Prof. Watson's planet with that of which Leverrier has indicated the track, he believes he has shown that there is no incompatibility between the observed and hypothetical objects. If only one such planet exist between Mercury and the sun M. Gaillot points out that, in order to account for the accelerated motion in the perihelion of Mercury, its mass must be nearly equal to that of the latter—an inference drawn from Leverrier's table in vol. v. of the Paris Annales. An ephemeris extending to September I is appended to M. Gaillot's communication in the Comptes Rendus of August 5. Remarking that the assumed sidereal period of Prof. Watson's planet is 24.25 days, the synodical period is nearly twenty-six days, and accordingly we find by the ephemeris that the body should pass nearly at the same distance in longitude and latitude from the sun on August 24. But considering that this must hold during the next revolution whatever the period of any possible intra-Mercurial planet may be, it may be suggested that the most effectual plan of search will be to watch daily the vicinity so indicated with our larger instruments beyond the period at which the hypothetical planet should pass according to M. Gaillot's ephemeris. To set the equatorial it will be sufficient to subtract 9m. 50s. from the sun's right ascension at the proposed time of search, and to add to the sun's N.P.D. a quantity varying from 23' on August 22, to 17' on September 10.

A COMPANION OF a LYRÆ.—On several occasions during the last ten years, to our knowledge, attention has been directed to a star near a Lyræ in the n.f. quadrant, and suspicion of variability entertained, from the observer not having distinctly remarked it previously. An inquiry on the same point was lately addressed by a correspondent to Prof. Winnecke. The star is on an angle of about 42°, distance 139". In October, 1870, it was a full magnitude fainter than the well-known Herschelian companion. Possibly some reader interested in the variable stars may be able to say if there is any reason to include the more distant star in this class of objects. In due course the direction of the proper motion of the large star will bring it immediately upon this comes, supposing there be no physical connection.

SCHMIDT'S "CHARTE DER GEBIRGE DES MONDES."—We hope next week to give some account of this most laborious and valuable work, which has been produced, through the liberality and scientific spirit of the Prussian government, in a style and with a perfection of arrangement that reflect the highest credit on all concerned. Probably no astronomical work could possess a greater degree of interest for amateurs generally, and—considering the attention paid to the examination of the moon's surface in this country—to British amateurs especially.

## GEOGRAPHICAL NOTES

THE Arctic exploring ship Alert is being again fitted out for active duty, under the command of her old captain, Sir George Nares. She is intended for a voyage of surveying service principally in the South Pacific. Her first work will be an examination of the inner water leading from the Straits of Magellan to the Gulf of Peñas, along the seaboard of Chili; from this she will stretch across the South Pacific Ocean towards Fiji adding (en route) as far as practicable to our knowledge of the hydrography of the Low Archipelago, Society and Friendly Islands. After a few months spent in the neighbourhood of Fiji and in an examination of dangers lying in the track of navigation between that group and the Colony of New Zealand, she will, for the latter part of her voyage, be employed off the North Western Coast of Australia, principally in ascertaining the positions of, and as far as necessary charting, the various reefs and islets lying off the Australian continent, and between it and the ports of the Dutch Indies, at many of which reefs, &c.,

traffic has been for some time increasing in the search for trepang, pearls, and guano.

THE Mittheilungen of the Vienna Geographical Society, Nos. 6 and 7, contains a valuable "Culture-Map" of Asia Minor, exhibiting in a satisfactory manner the various zones of vegetation which mark that region recently brought into such intimate relations with this country. The map is by A. v. Schweiger-Lerchenfeld, who contributes also the explanatory text. Dr. Ziegler describes the important works carried on during 1877-8 by the Swiss correspondents of the Society, and Prof. Schmick contributes a paper on Ocean Currents.

FROM America we have No. 2, 1878, of the always interesting Bulletin of the American Geographical Society. A paper on "Japan, Geographical and Social," by the Rev. W. E. Griffis, contains the results of much research, as well as of personal observation, and is an important contribution to our knowledge of that country. Dr. Wright Hawkes discusses in an able and unprejudiced manner "The So-called Celtic Monuments of Britanny," his conclusion being that the evidence as to their origin is very conflicting. Mr. Jess Young, who was astronomer to Giles's trans-Australian expedition, gives an account of the results of his observations while crossing the great Australian desert.

THE Geographical Society of St. Petersburg intends to publish Karl Ritter's works in Russian in celebration of his jubilee.

WE learn that a new branch of the Russian Geographical Society, independent of those of Orenburg and Western Siberia, will shortly be opened at Tashkent.

WE have received from Williams and Norgate a neat and well-executed map of Cyprus, by Kiepert of Berlin, upon a sufficiently large scale to show distinctly the chief features of the island.

## NOTES

PROF. MENDÉLEEFF is to be absent from his post in the St. Petersburg University for a year for the purpose of visiting Western Europe, where he will devote his time to the preparation of a large work on aëronautics. The work will contain a historical sketch of the subject, and expound its present condition from a scientific point of view.

THE appearance is announced of a biography of the late Prof. von Baer, by Dr. Stida, Professor in the Dorpat University. The autobiography of Baer appeared some years before his death, but embraced only his childhood and youth. The work of Dr. Stida is chiefly devoted to the scientific life of Baer, and contains a complete review of his works.

WE are glad to see that the Times is beginning to recognise the national importance of science-teaching in schools, and the necessity for our legislators being able to estimate the bearings of the various problems in physical science which are involved in the measures that come before them, in which the national welfare is involved. In a leading article on the meeting of the British Association the Times says that "We are living in a time when legislation is busy with physical matters, and is likely to become more so. The tendency of unscientific persons, especially when they are politicians, is to ignore the certainties which physical science furnishes, and hence to suppose that legislation about physical matters may properly be conducted upon a basis of compromise, like legislation about matters of opinion. It is very important that people who are not scientific themselves, and who never will be, should yet possess enough scientific knowledge to understand the difference which separates questions on which compromise is proper or expedient from those in which it would be fatal to the attainment of the desired result." The Times seems to us in-